

AUTOMOTIVE: ELECTRICAL / ELECTRONICS

COURSE DESCRIPTION

Automotive: Electrical/Electronics is a course that prepares students for entry-level positions or advanced training in automotive electrical and electronics systems. Students apply principles of electronics to automotive technology and develop diagnostic skills. The course provides students the opportunity to acquire marketable skills by training in the use of digital and analog voltmeters, ohmmeters, and amp-meters; as well as oscilloscopes, test-lights, load-testers and specialized electrical test equipment. Education experiences simulate automotive service industry operations through the use of training aids and modules and school-based learning opportunities.

Course content prepares students for the Automotive Service Excellence (ASE) Electrical and Electronics.

Recommended: Transportation Core

Requirement: A minimum of 200 hours must be dedicated to electrical and electronics to meet minimum standards set by NATEF.

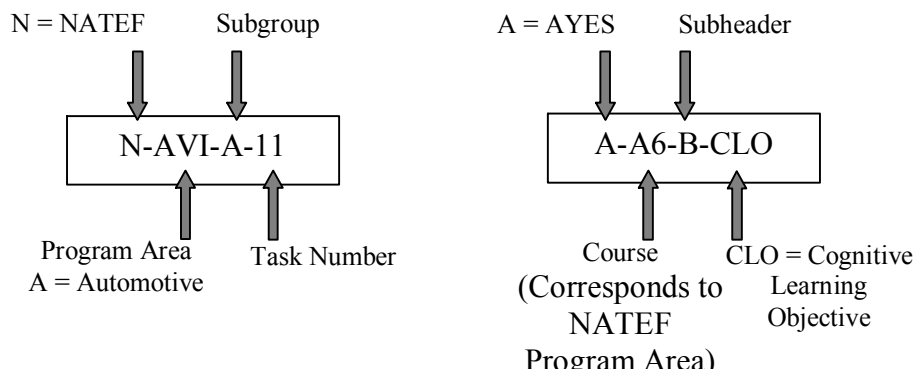
Recommended Credits: 2 or 3 (NATEF certified program only)

Recommended Grade Level: 10th, 11th, or 12th

Number of Competencies in Course: 58 / 84

Note: Course is aligned with NATEF task list for Automotive: Electronics systems. Items have been organized based on requirements of Tennessee required course description format.

Electrical



AUTOMOTIVE: ELECTRICAL/ELECTRONICS STANDARDS

- 1.0** Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.
- 2.0** Students will demonstrate automotive technology safety practices, including Occupational Safety and Health Administration and Environmental Protection Agency requirements for an automotive repair facility.
- 3.0** Students will properly test, diagnose, service, and repair General Electrical System.
- 4.0** Students will properly test, diagnose, service, and repair a Battery System.
- 5.0** Students will properly test, diagnose, service, and repair Starting System.
- 6.0** Students will properly test, diagnose, service, and repair Charging System.
- 7.0** Students will properly test, diagnose, service, and repair Lighting Systems.
- 8.0** Students will properly test, diagnose, service, and repair Gauges, Warning Devices, and Driver Information Systems.
- 9.0** Students will properly test, diagnose, service and repair Horn and Wiper/Washer systems.
- 10.0** Students will properly test, diagnose, service, and repair Accessories.f
- 11.0** Students will demonstrate communication skills required in the automotive service industry.
- 12.0** Students will demonstrate interpersonal and employability skills required in the automotive service industry.

AUTOMOTIVE: ELECTRICAL/ELECTRONICS

STANDARD 1.0

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

LEARNING EXPECTATIONS

The student will:

- 1.1** Lead a team.
- 1.2** Participate in SkillsUSA as an integral part of classroom instruction.
- 1.3** Assess client complaint and apply problem-solving and decision-making skills to communicate with the client.
- 1.4** Demonstrate teamwork skills.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 1.1A** As a team leader, demonstrates character and leadership skills to accomplish a project.
- 1.1B** Evaluates the effectiveness of a team and develops a plan for improvement.
- 1.2A** Applies the points of the creed and purposes of SkillsUSA in the classroom and laboratory.
- 1.2B** Demonstrates rules of parliamentary procedure to express ideas to a group.
- 1.3A** Analyzes situations in the workplace and uses conflict resolution techniques to solve the problem.
- 1.3B** Follows work order and communicates with client.
- 1.4A** Participates in a group to diagnose electrical systems.

SAMPLE PERFORMANCE TASKS

- Analyze the classroom and laboratory structure. Compile a proposal to organize the classroom and laboratory to show improvement in effectiveness.
- Participate in various SkillsUSA programs and/or competitive events.
- Evaluate an activity within the school, community, and/or workplace and develop a plan for improvement using teamwork skills.
- Implement an annual program of work.
- Prepare a meeting agenda for a SkillsUSA monthly meeting.
- Attend a professional organization meeting or trade show relating to the automotive service industry.

INTEGRATION LINKAGES

SkillsUSA, *Professional Development Program*, SkillsUSA, Communications and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Math, Technical Math, English IV: Communication for Life, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies

AUTOMOTIVE: ELECTRICAL/ELECTRONICS

STANDARD 2.0

Students will demonstrate automotive technology safety practices, including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements for an automotive repair facility.

LEARNING EXPECTATIONS

The student will:

- 2.1** Determine safe and correct procedures for working with electricity in an automotive repair facility.
- 2.2** Use protective clothing, eye protection, and safety equipment.
- 2.3** Use fire protection equipment.
- 2.4** Follow OSHA and EPA regulations and manufacturers specifications affecting electrical and electronic automotive systems.
- 2.5** Respond to safety communications referring to electrical and electronic systems.
- 2.6** Pass with 100 % accuracy a written examination relating to safety issues.
- 2.7** Pass with 100% accuracy a performance examination relating to safety.
- 2.8** Maintain a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 2.1A** Conforms to federal, state, local regulations, and manufacturer's specifications when working with electricity.
- 2.1C** Inspects first aid supplies and determines supplies and procedures for electrical injuries.
- 2.2A** Demonstrates proper usage of special safety equipment used while working on electrical and electronic systems.
- 2.2B** Selects and uses the appropriate protective clothing and eye protection.
- 2.3A** Selects the proper fire extinguisher for an electrical fire.
- 2.3B** Demonstrates the proper use of a fire extinguisher and determines effectiveness.
- 2.4A** Locates regulatory information and manufacturer recall information pertaining to electrical and electronic systems.
- 2.4B** Extracts information from Material Safety Data Sheets.
- 2.5A** Interprets manufacturer correspondence for safety regulations.
- 2.5B** Complies with safety procedures.
- 2.5C** Complies with relevant regulations and standards pertaining to electrical and electronic systems.
- 2.6** Passes with 100% accuracy a written examination relating specifically to electrical and electronic safety issues.
- 2.7** Passes with 100% accuracy a performance examination relating specifically to electrical and electronic tools and equipment.
- 2.8** Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

SAMPLE PERFORMANCE TASKS

- Assess the work area for safety hazards.
- Design a corrections program for identified hazards.
- Model the appropriate protective equipment for an assigned task.
- Read manufacturer specifications to determine safe practices while working on various electrical and electronic systems.

INTEGRATION LINKAGES

Mathematics, Technical Math, Physics, Science, Electronics Technology Literacy, English IV: Communication for Life, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: ELECTRICAL/ELECTRONICS

STANDARD 3.0

Students will properly test, diagnose, service, and repair General Electrical System

LEARNING EXPECTATIONS

The student will:

- 3.1** Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1
- 3.2** Identify and interpret electrical/electronic system concern; determine necessary action. P-1
- 3.3** Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins. P-1
- 3.4** Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals). P-1
- 3.5** Diagnose electrical/electronic integrity for series, parallel and series-parallel circuits using principles of electricity (Ohm's Law). P-1
- 3.6** Use wiring diagrams during diagnosis of electrical circuit problems. P-1
- 3.7** Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems. P-1
- 3.8** Check electrical circuits with a test light; determine necessary action. P-2
- 3.9** Measure source voltage and perform voltage drop tests in electrical/electronic circuits using a voltmeter; determine necessary action. P-1
- 3.10** Measure current flow in electrical/electronic circuits and components using an ammeter; determine necessary action. P-1
- 3.11** Check continuity and measure resistance in electrical/electronic circuits and components using an ohmmeter; determine necessary action. P-1
- 3.12** Check electrical circuits using fused jumper wires; determine necessary action. P-2
- 3.13** Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action. P-1
- 3.14** Measure and diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action. P-1
- 3.15** Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. P-1
- 3.16** Inspect and test switches, connectors, relays, solid state devices, and wires of electrical/electronic circuits; perform necessary action. P-1
- 3.17** Remove and replace terminal end from connector. P-1
- 3.18** Repair connectors and terminal ends. P-1
- 3.19** Repair wiring harness (including CAN/BUS systems). P-1
- 3.20** Perform solder repair of electrical wiring. P-1
- 3.21** Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures. P-3

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 3.1 Completes work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. N-AVI-A-1
- 3.2 Identifies and interprets electrical/electronic system concern; determines necessary action. N-AVI-A-2
- 3.3 Researches applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins. N-AVI-A-3
- 3.4 Locates and interprets vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals). N-AVI-A-4
- 3.5 Diagnoses electrical/electronic integrity for series, parallel and series-parallel circuits using principles of electricity (Ohm's Law). N-AVI-A-5
- 3.6 Uses wiring diagrams during diagnosis of electrical circuit problems. N-AVI-A-6
- 3.7 Demonstrates the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems. N-AVI-A-7
- 3.8 Checks electrical circuits with a test light; determines necessary action. N-AVI-A-8
- 3.9 Measures source voltage and perform voltage drop tests in electrical/electronic circuits using a voltmeter; determines necessary action. N-AVI-A-9
- 3.10 Measures current flow in electrical/electronic circuits and components using an ammeter; determines necessary action. N-AVI-A-10
- 3.11 Checks continuity and measure resistance in electrical/electronic circuits and components using an ohmmeter; determines necessary action. N-AVI-A-11
- 3.12 Checks electrical circuits using fused jumper wires; determines necessary action. N-AVI-A-12
- 3.13 Locates shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determines necessary action. N-AVI-A-13
- 3.14 Measures and diagnoses the cause(s) of excessive key-off battery drain (parasitic draw); determines necessary action. N-AVI-A-14
- 3.15 Inspects and tests fusible links, circuit breakers, and fuses; determines necessary action. N-AVI-A-15
- 3.16 Inspects and tests switches, connectors, relays, solid state devices, and wires of electrical/electronic circuits; performs necessary action. N-AVI-A-16
- 3.17 Removes and replaces terminal end from connector. N-AVI-A-17
- 3.18 Repairs connectors and terminal ends. N-AVI-A-18
- 3.19 Repairs wiring harness (including CAN/BUS systems). N-AVI-A-19
- 3.20 Performs solder repair of electrical wiring. N-AVI-A-20
- 3.21 Identifies location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures. N-AVI-A-21

SAMPLE PERFORMANCE TASKS

- Use a Digital Multimeter (DMM) to measure the voltage of a sample automotive electrical circuit.
- In teams, diagnose problems in a circuit and make recommendations to correct it.
- Diagnose and repair electrical systems such as ignition, charging, starting, fuel injections, power door locks, and horn operations
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Technical Math, Physics, Science, Electronics Technology Literacy, English IV: Communication for Life, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: ELECTRICAL/ELECTRONICS

STANDARD 4.0

Students will properly test, diagnose, service, and repair a Battery System

LEARNING EXPECTATIONS

The student will:

- 4.1 Perform battery state-of-charge test; determine necessary action. P-1
- 4.2 Perform battery capacity test; confirm proper battery capacity for vehicle application; determine necessary action. P-1
- 4.3 Maintain or restore electronic memory functions. P-1
- 4.4 Inspect, clean, fill, and replace battery. P-1
- 4.5 Perform slow/fast battery charge. P-2
- 4.6 Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed. P-1
- 4.7 Start a vehicle using jumper cables and a battery or auxiliary power supply. P-1
- 4.8 Identify high voltage circuits of electric or hybrid electric vehicles and related safety precautions. P-3
- 4.9 Identify electronic modules, security systems and/or radios that require reinitialization or code entry following battery disconnect. P-2
- 4.10 Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. P-3

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 4.1 Performs battery state-of-charge test and determines needed service. N-AVI-B-1
- 4.2 Performs battery capacity test; confirms proper battery capacity for vehicle application; determines necessary action. N-AVI-B-2
- 4.3 Maintains or restores electronic memory functions. N-AVI-B-3
- 4.4 Inspects, clean, fills, and replaces battery. N-AVI-B-4
- 4.5 Performs a slow/fast battery charge. N-AVI-B-5
- 4.6 Inspects and cleans battery cables, connectors, clamps, and hold-downs; repairs or replaces as needed. N-AVI-B-6
- 4.7 Starts a vehicle using jumper cables and a battery or auxiliary power supply. N-AVI-B-7
- 4.8 Identifies high voltage circuits of electric or hybrid electric vehicles and related safety precautions. N-AVI-B-8
- 4.9 Identifies electronic modules, security systems and/or radios that require reinitialization or code entry following battery disconnect. N-AVI-B-9
- 4.10 Identifies hybrid vehicle auxiliary (12v) battery service, repairs, and tests procedures. N-AVI-B-10

SAMPLE PERFORMANCE TASKS

- Jump-start a vehicle.
- Determine if a battery should be replaced or recharged by performing an open-circuit voltage test and then a capacity test.
- Using scenarios, follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Technical Math, Physics, Science, Electronics Technology Literacy, English IV: Communication for Life, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: ELECTRICAL/ELECTRONICS

STANDARD 5.0

Students will properly test, diagnose, service, and repair Starting System

LEARNING EXPECTATIONS

The student will:

- 5.1** Perform starter current draw tests; determine necessary action. P-1
- 5.2** Perform starter circuit voltage drop tests; determine necessary action. P-1
- 5.3** Inspect and test starter relays and solenoids; determine necessary action. P-2
- 5.4** Remove and install starter in a vehicle. P-1
- 5.5** Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action. P-2
- 5.6** Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition. P-2

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 5.1** Performs starter current draw tests and determines necessary action. N-AVI-C-1
- 5.2** Performs starter circuit voltage drop tests and determines necessary action. N-AVI-C-2
- 5.3** Inspects and tests starter relays and solenoids; determines necessary action. N-AVI-C-3
- 5.4** Removes and installs starter. N-AVI-C-4
- 5.5** Inspects and tests switches, connectors, and wires of starter control circuits; performs necessary action. N-AVI-C-5
- 5.6** Differentiates between electrical and engine mechanical problems that cause a slow-crank or no-crank condition. N-AVI-C-6

SAMPLE PERFORMANCE TASKS

- Test the starter electrical circuit.
- Remove and replace a starter motor.
- Perform a starter draw test.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Technical Math, Physics, Science, Electronics Technology Literacy, English IV: Communication for Life, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National

Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: ELECTRICAL/ELECTRONICS

STANDARD 6.0

Students will properly test, diagnose, service, and repair Charging System

LEARNING EXPECTATIONS

The student will:

- 6.1** Perform charging system output test; determine necessary action. P-1
- 6.2** Diagnose charging system for the cause of undercharge, no-charge, and overcharge conditions. P-1
- 6.3** Remove, inspect, and install generator (alternator). P-1
- 6.4** Perform charging circuit voltage drop tests; determine necessary action. P-1
- 6.5** Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment. P-1

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 6.1** Performs charging system output test and determines necessary action. N-AVI-D-1
- 6.2** Diagnoses charging system for the cause of undercharge, no-charge, or overcharge conditions. N-AVI-D-2
- 6.3** Replaces/installs generator (alternator). N-AVI-D-4
- 6.4** Performs charging circuit voltage drop tests and determines necessary action. N-AVI-D-5
- 6.5** Inspects, adjusts, or replaces generator (alternator) drive belts, pulleys, and tensioners; checks pulley and belt alignment. N-AVI-D-3

SAMPLE PERFORMANCE TASKS

- Repair an alternator component.
- Adjust a drive belt.
- Inspect charging system for overcharge or no charge.
- Check alternator amperage output.

INTEGRATION LINKAGES

Mathematics, Technical Math, Physics, Science, Electronics Technology Literacy, English IV: Communication for Life, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: ELECTRICAL/ELECTRONICS

STANDARD 7.0

Students will properly test, diagnose, service, and repair Lighting Systems

LEARNING EXPECTATIONS

The student will:

- 7.1** Diagnose the cause of brighter than normal, intermittent, dim, or no light operation; determine necessary action. P-1
- 7.2** Inspect, replace, and aim headlights and bulbs. P-2
- 7.3** Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action P-2
- 7.4** Identify system voltage and safety precautions associated with high intensity discharge headlights. P-3

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 7.1** Diagnoses the cause of brighter than normal, intermittent, dim, or no light operation; determines necessary action. N-AVI-E-1
- 7.2** Inspects, replaces, and aims headlights and bulbs. N-AVI-E-2
- 7.3** Inspects and diagnoses incorrect turn signal or hazard light operation; performs necessary action N-AVI-E-3
- 7.4** Identifies system voltage and safety precautions associated with high intensity discharge headlights. N-AVI-E-4

SAMPLE PERFORMANCE TASKS

- Determine lighting problem in tail light.
- Replace tail light bulb.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Technical Math, Physics, Science, Electronics Technology Literacy, English IV: Communication for Life, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA).

AUTOMOTIVE: ELECTRICAL/ELECTRONICS

STANDARD 8.0

Students will properly test, diagnose, service, and repair Gauges, Warning Devices, and Driver Information Systems

LEARNING EXPECTATIONS

The student will:

- 8.1** Inspect and test gauges and gauge sending units for cause of intermittent, high, low, or no gauge readings; determine necessary action. P-1
- 8.2** Inspect and test connectors, wires, and printed circuit boards of gauge circuits; determine necessary action. P-3
- 8.3** Diagnose the cause of incorrect operation of warning devices and other driver information systems; determine necessary action. P-1
- 8.4** Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action. P-3

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 8.1** Inspects and test gauges and gauge sending units for cause of intermittent, high, low or no gauge readings and determines necessary action. N-AVI-F-1
- 8.2** Inspects and tests connectors, wires, and printed circuit boards of gauge circuits; determines necessary action. N-AVI-F-2
- 8.3** Diagnoses the cause of incorrect operation of warning devices and other driver information systems; determines necessary action. N-AVI-F-3
- 8.4** Inspects and tests sensors, connectors, and wires of electronic (digital) instrument circuits; determines necessary action. N-AVI-F-4

SAMPLE PERFORMANCE TASKS

- Repair rear window heated glass system.
- Diagnose and repair car radio.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process

INTEGRATION LINKAGES

Mathematics, Technical Math, Physics, Science, Electronics Technology Literacy, English IV: Communication for Life, Problem Solving, Communication and Writing Skills, Teamwork

Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: ELECTRICAL/ELECTRONICS

STANDARD 9.0

Students will properly test, diagnose, service, and repair Horn and Wiper/Washer systems.

LEARNING EXPECTATIONS

The Student will:

- 9.1** Diagnose incorrect horn operation; perform necessary action. P-2
- 9.2** Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action. P-2
- 9.3** Diagnose incorrect washer operation; perform necessary action. P-2

PERFORMANCE STANDARDS: EVIDENCE STANDARDS IS MET

- 9.1** Diagnoses incorrect horn operation; performs necessary action. N-AVI-G-1
- 9.2** Diagnoses incorrect wiper operation; diagnoses wiper speed control and park problems; performs necessary action. N-AVI-G-2
- 9.3** Diagnoses incorrect washer operation; performs necessary action. N-AVI-G-3

SAMPLE PERFORMANCE TASKS

- Repair vehicle horn system.
- Diagnose and repair wiper/washer system.
- Using scenarios, follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process

INTEGRATION LINKAGES

Mathematics, Technical Math, Physics, Science, Electronics Technology Literacy, English IV: Communication for Life, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: ELECTRICAL/ELECTRONICS

STANDARD 10.0

Students will properly test, diagnose, service, and repair Accessories

LEARNING EXPECTATIONS

The student will:

- 10.1** Diagnose incorrect operation of motor-driven accessory circuits; determine necessary action. P-2
- 10.2** Diagnose incorrect heated glass, mirror or seat operation; determine necessary action. P-3
- 10.3** Diagnose incorrect electric lock operation; determine necessary action. P-2
- 10.4** Diagnose incorrect operation of cruise control systems; determine necessary action. P-3
- 10.5** Diagnose supplemental restraint system (SRS) concerns; determine necessary action. (Note: Follow manufacturer's safety procedures to prevent accidental deployment.) P-2
- 10.6** Disarm and enable the airbag system for vehicle service. P-1
- 10.7** Diagnose radio static and weak, intermittent, or no radio reception; determine necessary action. P-3
- 10.8** Remove and reinstall door panel. P-1
- 10.9** Diagnose body electronic system circuits using a scan tool; determine necessary action. P-2
- 10.10** Check for module communication (including CAN/BUS systems) errors using a scan tool. P-3
- 10.11** Diagnose the cause of false, intermittent, or no operation of anti-theft system. P-2

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 10.1** Diagnoses incorrect operation of motor-driven accessory circuits; determines necessary action. N-AVI-H-1
- 10.2** Diagnoses incorrect heated glass, mirror or seat operation; determines necessary action. N-AVI-H-2
- 10.3** Diagnoses incorrect electric lock operation; determines necessary action. N-AVI-H-3
- 10.4** Diagnoses incorrect operation of cruise control systems; determines necessary action. N-AVI-H-4
- 10.5** Diagnoses supplemental restraint system (SRS) concerns; determines necessary action. (Note: Follow manufacturer's safety procedures to prevent accidental deployment.) N-AVI-H-5
- 10.6** Disarms and enables the airbag system for vehicle service. N-AVI-H-6
- 10.7** Diagnoses radio static and weak, intermittent, or no radio reception; determines necessary action. N-AVI-H-7
- 10.8** Removes and reinstalls door panel. N-AVI-H-8
- 10.9** Diagnoses body electronic system circuits using a scan tool; determines necessary action. N-AVI-H-9

10.10 Checks for module communication (including CAN/BUS systems) errors using a scan tool. N-AVI-H-10

10.11 Diagnoses the cause of false, intermittent, or no operation of anti-theft system. N-AVI-H-11

SAMPLE PERFORMANCE TASKS

- Remove and reinstall door panel
- Using scenarios, follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Technical Math, Physics, Science, Electronics Technology Literacy, English IV: Communication for Life, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: ELECTRICAL/ELECTRONICS

STANDARD 11.0

Students will demonstrate communication skills required in the automotive service industry.

LEARNING EXPECTATIONS

The student will:

- 11.1** Communicate and comprehend oral and written information pertaining to electrical and electronic systems.
- 11.2** Solve electrical problems and make decisions using a logical process.
- 11.3** Use teamwork skills to solve problems relating to electrical and electronic system issues.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 11.1A** Interprets and uses written information in common job formats, such as tables, charts, and reference materials and manuals to solve electrical and electronic system problems.
- 11.1B** Interprets and uses graphical information such as blueprints, electrical schematics, process control schematics, automotive flow charts, and other automotive diagrams to solve electrical and electronic system problems.
- 11.1C** Uses electronic resources to obtain electrical and electronic service and other automotive information.
- 11.1D** Analyzes information obtained from various sources to determine an electrical and electronic diagnostic solution.
- 11.1E** Interprets an automotive repair order for an electrical/electronic system.
- 11.2A** Develops a hypothesis regarding the cause of a problem.
- 11.2B** Tests the hypothesis to determine the solution to the electrical/electronic problem.
- 11.2C** Creates, evaluates, and revises a plan to resolve a problem.
- 11.2D** Implements strategy based diagnostic procedure by verifying the complaint, defining the problem, isolating the problem, validating the problem, making repairs, and testing the repairs in an electrical/electronic system.
- 11.3A** Serves in each of the functional roles of a team.
- 11.3B** Resolves conflicts within a group.
- 11.3C** Demonstrates appropriate and positive examples of giving and accepting criticism.
- 11.3D** Modifies behavior or revises work based on appropriate criticism.
- 11.3E** Solves problems in cooperation with other members of a group.
- 11.3F** Evaluates the role of the automotive technician within the organizational system of a dealership or fleet shop.

SAMPLE PERFORMANCE TASKS

- Use reference materials to determine procedures for diagnosing and testing automotive electrical systems.
- Work as a team member to develop a diagnostic strategy.
- Use blueprints and diagrams to execute a task.
- Use professional and technical language in the classroom and laboratory.

INTEGRATION LINKAGES

Mathematics, Technical Math, Physics, Science, Electronics Technology Literacy, English IV: Communication for Life, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: ELECTRICAL/ELECTRONICS

STANDARD 12.0

Students will demonstrate interpersonal and employability skills required in the automotive services industry.

LEARNING EXPECTATIONS

The student will:

- 12.1** Infer relationships between honesty, integrity, and organization and personal job success.
- 12.2** Demonstrate attitudes conducive to workplace success.
- 12.3** Maintain electrical and electronic equipment in a neat and orderly work area.
- 12.4** Assess implications of cultural and religious diversity for classroom and workplace relationships.
- 12.5** Develop individual and team time management and work sequencing skills to increase productivity in electrical and electronic systems diagnostics and repair.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 12.1A** Illustrates the concept of integrity.
- 12.1B** Assesses the potential impact of an individual's work ethic on an organizational system.
- 12.1C** Infers the relationship between organization and personal job success in electrical and electronics system servicing.
- 12.2A** Modifies behavior to increase productivity in the classroom, laboratory and workplace.
- 12.2B** Demonstrates awareness of activities occurring concurrently in the classroom and workplace.
- 12.3A** Keeps electrical and electronic equipment in a clean and organized work area.
- 12.3B** Maintains work area according to NATEF and OSHA standards.
- 12.3C** Recognizes the correlation between a clean orderly work environment and successful and efficient job in electrical and electronics systems servicing.
- 12.4A** Assesses benefits and predicts problems that may arise from diversity in work teams.
- 12.4B** Devises solutions to problems arising from gender, cultural, racial, and religious diversity.
- 12.5A** Assesses the benefits of incorporating time management principles into electrical and electronic system servicing.
- 12.5B** Displays time management and work sequencing skills in electrical and electronic system servicing.
- 12.5C** Demonstrates the ability to diagnose and repair electrical and electronic systems within manufacturers labor operation time.

SAMPLE PERFORMANCE TASKS

- Maintain an orderly work area.
- Lead a problem-solving team.
- Consistently arrive at class on time.
- Participate in an internship in a dealership.
- Resolve an interpersonal conflict in the classroom.
- Using scenarios, follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Technical Math, Physics, Science, Electronics Technology Literacy, English IV: Communication for Life, Problem Solving, Communication and Writing Skills, Teamwork Skills, Leadership Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES Curriculum, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health (OSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: ELECTRICAL/ELECTRONICS

SAMPLING OF AVAILABLE RESOURCES

A6 Automotive Electrical/Electronics Course, AYES Curriculum, AYES Corporation,
www.ayes.org

A0 Fundamentals of Automotive Service Technology, AYES Curriculum: A Tenth Grade Course,
AYES Corporation, www.ayes.org

A6 Electrical/Electronic Systems, CD-ROM, Interactive Computer Based Training, DVP/CDX,
1-888-873-2239

Fundamentals of Electronics, Russell Meade, Delmar Publishing

Fundamentals of Electric and Electronic Circuits, Mandl, Prentice Hall

Introduction to Automotive Service Technology, Service Series, Curriculum and Instructional
Material Center (CIMC), Oklahoma Department of Vocational and Technical Education

Module 1 Introduction to Automotive Technology, Instructional Materials Laboratory (IML),
University of Missouri

2002 Automobile Task List, National Automotive Technicians Education Foundation (NATEF),
www.natef.org